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CAMBODIA, LAOS, THAILAND AND VIET-NAM

Committee for Coordination of Investigations
of the Lower Mekong Basin
Sixteenth Session (Plenary)
3 - 8 January 1962
Phnom Penh, Cambodia

HYDROLOGICAL AND METEOROLOGICAL SYSTEM IN THE LOWER MEKONG BASIN

Operation after 19 May 1962

Report of the Associate Consultant-Engineer

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Introduction

This report completes the note, adopted by the fourteenth session of the Committee, drafted by Mr. R. Berthelot, WMO Expert, on suggestions for the operation after May 1962 of the hydrological and meteorological system set up under the U.S. assistance programme (Harza), with equipment provided by the United States, France, the United Kingdom and New Zealand.

For the preparation of this report, the author visited the stations installed in the four riparian countries, had consultations with the relevant officials, discussed with them the organization of the hydrological and meteorological surveys after the transfer of responsibilities, and prepared budgetary statements for this purpose.

The report includes three sections:

1. Progress report on the programme implemented by Harza;
2. Organization of national services for operation after May 1962 of the hydrological and meteorological system set up by Harza.
3. Recommendations.

/Section 1

Section 1

Progress report on implementation at 31 December 1961 of the hydrological, meteorological, topographic and hydrographic programme undertaken by Harza Engineering Company

I. Hydrology

In accordance with its contract with ICA, the Harza Engineering Co. is responsible for the following works and surveys:

(a) Determination of appropriate sites, installation and operation of 38 gaging stations.

(b) Preparation of a systematic and continuous data collecting programme with a view to obtaining uniform data relating to sections, elevations, discharges and suspended-load charge, including computations on such data and measurements to be made at the various stations.

The Harza Corporation first purchased measurement instruments to complete those which were placed at its disposal by the Committee, thanks to assistance offered by various countries.

The general locations for river gages and measurement sites were originally scheduled according to the recommendations of the "Wheeler Report". Harza and riparian countries later recommended several changes which were approved by the Coordinating Committee and by ICA. The exact locations in the field were selected by Harza engineers with the approval of representatives of the respective countries. The river gages were installed as river stages, security conditions, and availability of equipment permitted.

Moreover, the firm prepared standards for gaging stations and discharge measurements, as well as standard forms for measurements and data collection. This report includes a general description of stations visited by the associate consultant-engineer. Considering the very limited time available, all stations have not been inspected; some of them are not accessible for reasons of security, while for other stations inspection would require much more time and resources.

/Mekong at

Mekong at Chiang Sen, Thailand. Harza has installed a staff gage and bubble gage. The section chief, Mr. Snun Ruanglek, who resides in the vicinity of the gage station, takes daily readings of the staff gage and controls the bubble gage.

Nam Ou at Ban Vang Lê, Laos. Harza has installed only a staff gage. Security conditions have prevented installation of a recorder. Daily gage readings were recently resumed after a lapse of several months. Technicians from Luang Prabang make discharge measurements and take sediment samples when security permits.

Nam Khan at Ban Mout, Laos. A recording gage is installed, referred to a staff gage. The reader, Mr. Thao Sene, resides at the site. The Luang Prabang team makes discharge measurements and takes water samples.

Mekong at Luang Prabang, Laos. Staff gage and recording gage. The measurement team includes two PWD supervisors (Mr. Houmpheng Manipoum and Mr. Bonthon Pantavady) and Mr. V. Sayassane. At the present time, discharge measurements are taken twice a week.

Mekong at Ban Pha Tang. (Pamong), Thailand. Harza has installed a recording gage which is used for investigations of the projected dam; the station is located a few kilometres upstream of Vientiane. No discharge measurements are taken but there is a good rating curve based on measurements at Vientiane.

Mekong at Vientiane, Laos. The recording gage has been installed at BanVat Sop 4 km. downstream from Vientiane. The shelter is strong, the staff gage is fixed to one of the wooden warf piles of the port. The discharge measurement section is located at Ban Vat Sok, 6.5 km. downstream from Vientiane. It is not very stable.

The Vientiane team includes:

Mr. Phomma Sayarath, Inspector
Thao Somdeth, Engineer (graduate from Montreal)
Backeo Saycoca, Inspector
Boum Larang, Computor

They are in charge of measurements at Vientiane, Tha Ngon and Ban Phan Si and maintenance of Ban Pha Tang gage.

Nam Nguam at Tha Ngon, Laos. Recording gage and staff gage. Inspection was not possible because of security.

/Nam Ca Dinh

Mekong at Stung Treng, Cambodia. Bubble gage and staff gage. The Stung Treng team includes the following persons:

Mr. You Theng, PWD Inspector
Prun Sambath
Khieu Chhem

This team is in charge of discharge measurements on the Mekong, on the Se San and on the Se Kong. Water samples are taken downstream of the junction, south of Stung Treng.

In the future, the Stung Treng team will also make measurements at Kratie.

Mekong at Kompong Cham, Cambodia. Recording gage and staff gage opposite the Meteorological Department building. The site is excellent, the instruments operate satisfactorily. However, the staff gage should be clean.

This station has a number of historical data, but is influenced by the Tonle Sap, so that it is not possible to have a stable relation between discharge and stage. The Kratie data should be used.

Stung Sen at Ban Gna Chi and Kompong Thom. Recording gages and staff gages. The Stung Sen is a tributary of the Tonle Sap. The two stations provide slope measurement. At Ban Gna Chi, there is a staff-gage reader, Mr. Soi-Soc. A wooden raft bumped against the staff-gage and levelling should be remade. There is danger of scouring, the staff gage being on the concave side of the river.

At Kompong Thom, the recording gage shelter is less favourably located. It would be better placed on the town quay than on the right bank, which is used as a landing stage and where a boat is necessary to reach the gage. The staff gage is not long enough: and additional vertical section several meters long should be added.

Mekong at Phnom Penh. The recording gage is very well located on the quay close to the conference hall. The staff gage is located in a slanting position on the bank. At the time of inspection, the bubble gage had a loose pulley and needed to be readjusted.

/So far,

So far, sediment samples have been sent to Bangkok for analysis. But for some time now, they are being stored pending new developments. However, there is still no qualified technician to take charge of the laboratory: the laboratory was installed in December 1960 and is awaiting training of a technician by the French team.

Mekong at Mythuan. The recording gage is located near the ferry, on the Vinh Long side. The gage had been installed too close to the bank, and it later became necessary to displace it because the foundations were being attached by scouring.

There is another station near Sadec 30 km further upstream. This makes it possible to measure the difference of level between the two points and hence to determine the discharge by application of the Manning formula.

Bassac at Long-Xuyen. Two recording gages and staff-gages at Vam Cong (near the ferry downstream of Long-Xuyen) and at Binh Thuy (upstream).

Bassac at Chaudoc. Two recording gages and staff gages near the Triton Canal and at Chaudoc.

Currently velocity measurements on the Mekong and Bassac are being taken by means of current-meters during continuous ten-hour periods. Both the Mekong and the Bassac are under the influence of the semi-daily tides. The Harza engineer, Mr. V. Chang, has worked out a method of discharge measurement based on the Manning formula. This method requires lengthy computations involving the use of an electric computer, which Viêt-Nam does not possess.

Sediment sampling and laboratory tests.

The sediment sampling programme includes:

7 primary stations: minimum 100 samplings per year
7 secondary stations: 5 to 100 samplings per year
14 ordinary stations: less than 50 samplings per year.

All stations, with one exception, are located at the site of the discharge measurement stations. At end November 1961, a total of 786 sediment samples had been taken at 24 stations. Insecurity conditions and lack of instruments are the cause of the delay. For that work, Harza has 12 American type samplers and 2 French silt-samplers.

/Tests were

Tests were first conducted in Bangkok. At the present time, only the Phnom Penh laboratory is not yet in service. The Bangkok laboratory is located in the compound of the National Energy Authority and operates satisfactorily under the direction of Mr. Chan Chai. The Vientiane laboratory is directed by Mr. Thao Somdeth, Engineer (graduate of Montreal). The Saigon laboratory is located at Phu An, close to the hydraulics and soils laboratory. Mr. Vo Ngoc Diep, technical officer of the PWD and former trainee in Bangkok, is in charge of the laboratory.

II Meteorology

In accordance with its contract with ICA, Harza Corporation is to:

a) install 79 rainfall gaging stations and 20 evaporation stations with automatic recording instruments.

b) prepare a programme of data collection and systematic and continuous analysis of comparable data at the stations installed.

Equipment. Harza has purchased:

- 24 evaporation pans manufactured locally, and installed 19 of the scheduled 20. Four are spares.
- 67 recording rain gages, Kent brand of Malaya, of which 40 daily recording gages, 20 weekly recording gages and 7 long-period recording gages.. The purchase of the remaining 12 instruments was delayed due to conditions of insecurity at the sites where they were to be installed in Laos. They are now on order.

Observations standards were prepared in order to have a uniform method in all four riparian countries.

Furthermore, the United Kingdom has donated to the Mekong Committee a series of meteorological instruments such as:

/Sunshine

Sunshine recorders
Recording barometers
Thermohygrographs
Totalizing cup anemometers
Recording anemo-biagraphs and wind direction recorders
Actinometers
Thermometers
Standard hygrometers
Sling type hygrometers

Harza has installed nearly all the instruments, except in Laos, where security conditions have made it impossible to complete that operation. The records for the instruments donated by the United Kingdom are delivered directly to the Meteorological Departments of the riparian countries, who are themselves carrying out the necessary computations on data collected on rainfalls and evaporation, and interprete the results, which are then sent to WMO and edited in a yearbook.

Publication of hydrological and meteorological reports

It was agreed that Harza should make the necessary computations on stages, discharges and sedimentation loads, as well as on evaporation and rainfall. The HarzaCorporation is also collecting data on stage levels available for the period preceding its contract and is constructing graphs for the conversion of such levels into discharges, where possible.

Harza intends to publish 3 reports, covering the following periods:

1) Period previous to Harza contract
2) January 1959 to end 1960
3) During the year 1961.

No report has yet been published as on 31/12/61.

/III Topographic

III Topographic surveys

This work includes horizontal control surveys of the Mekong, levelling of the Mekong from Burma Border to the delta and of tributaries from their junction with the Mekong up to the measurement stations. The Canadian contribution also includes photo control surveys which were to be coordinated overlap with the work required from Harza. Canada has entrusted this work to the Photographic Survey Corporation. In order to reduce expenses and avoid duplication, Harza has sub-contracted to this corporation the ground control work included in their contract. This work includes:

972 km of first-order levelling
2679 km of third-order levelling
2805 km of third-order horizontal control.

The firm has completed the field work and the final reports which were produced include the following information:

1. Benchmark and reference point identification cards (totalling 810) showing level, order of levelling, reference number and geographical location, UTM coordinates, etc, with a photograph showing the location.

2. Preliminary tables relating to all horizontal and vertical control points, including reference levels, degree of accuracy, connection etc.

3. Final tables relating to all horizontal and vertical control points, with indications as listed in para. 2 above.

4. Films and 2 prints of each of the 9 map sheets representing the final traverses on a scale of 1/250,000, indicating the old benchmark and reference points used and includes in the project topographic survey, the new traverses and the benchmarks and reference points installed in the course of the project.

The above documents have been forwarded to the respective riparian countries. The photograph negatives are currently being stored by Harza in their bank.

Hydrographic surveys

The work entrusted to Harza, which originally consisted in the sounding of the navigable channel from Luang Prabang to the sea, was replaced by the determination of detailed cross-sections of the Mekong and Bassac in Viêt-Nam.

/The work

The work of the Bassac was subsequently suppressed but the work on the Mekong is to be completed from the sea right up to the Phnom Penh.

Considering current conditions, Harza subcontracted the hydrographic work to the Certeza Surveying Corporation after calling for proposals. The PWD of Cambodia and Viet-Nam provide the necessary personnel and equipment under their respective local contributions. The contract was signed on 22 August 1961 and the work is to be complete by February 1962.

Salinity

Harza Corporation received two salinometers for the measurement of water salinity during the dry season in South Viet-Nam. The instruments having been damaged during transport and the replacement of the damaged parts took quite some time.

Harza is now proceeding to tests in Bangkok, and the instruments will be sent later to Saigon.

Measurements will be made at various points on the Mekong and on the Bassac on an experimental basis only, as both the contract and the dry season are now coming to a close. But the Harza engineer in Saigon will draft a programme of work for the dry season of 1962-63; this programme will have to be coordinated with the exigencies of the delta mathematical model project.

Training of personnel

This was organized in the regional offices and the central office in Bangkok. In the regional offices, the personnel made available to Harza by the riparian governments is being trained in discharge measurements, including the corresponding computations.

In the Bangkok central office a number of technicians have received more detailed training, including technical courses and practical exercises and on-the-job training in the computation methods involved.

Cambodia has not yet been able to send any trainees to Bangkok.

A trainee from Laos, Mr. Thao Somdeth, is presently in Bangkok to follow an accelerated training course.

/The Thai

The Thai engineers, Mr. Thaipuck Thammongkol and Mr. Roengyuth Bhumirat, and the Vietnamese trainees, Mr. Le Phat Tan, engineer, and Mr. Vo.Ngoc Diep, technical officer, have successfully completed that training course.

Conclusion

Harza Company commenced their operations in December 1958. At the beginning, tje Company encountered certain difficulties which involved appreciable delays. In consequence, the expiration date of the contract was adjourned until 19 May 1962. However, there has not yet been three full years of data collection work at all stations.

Furthermore, the delay in the delivery of equipment, its deterioration due to transport and security conditions have delayed or even rendered impossible part of the work. Moreover, the Harza Corporation lost its chief engineer, Mr. R.D. Anderson, a young engineer of great value, who died on 6 May 1961, and his replacement involved further delays in the field work and computations.

Nevertheless, the transfer of responsibilities to the local governments can be effected without inconvenience at the scheduled date of 19 May 1962.

Despite certain delays over which it had no control, the Harza Company has nevertheless been able to perform excellent work and, in spite of numerous difficulties, has been able to install in each riparian country the basic framework of a hydrologic service, which in some cases, did not exist previously.

The riparian countries have expressed their gratitudes to the United States, under whose auspices this programme was undertaken, and to the friendly countries who completed the programme by donations of hydrological, meteorological or other equipment, such as boats, etc.

/Section 2

Section 2

Operation after May 1962 of the hydrological and meteorological system set up by Harza

The United Nations survey team under the leadership of General R.A. Wheeler recommended a programme of work (Table 5 of the Wheeler Report) including inter alia hydrologic and meteorologic observations during a period of 5 years, for which local costs during the first 3 years are being taken care of under the US programme (Harza), while during the next 2 years, operation and maintenance will be the responsibility of the countries concerned.

Mr. Berthelot's report already stressed the necessity of continuing the Mekong hydrological observation, as three years are not sufficient for the necessary data collection work.

Furthermore, the basic principles and assumptions upon which Harza organized their work were based on the idea that at expiration of the contract the surveys and field work would become the responsibility of the riparian governments, who would then continue the work.

Section 2 of this report purports to indicate how the riparian countries intend to continue by their own means the work which has been commenced. A short sub-section is devoted to each country. In each of these sub-sections we attempt to describe:

a) the administrative organisation
b) the technical personnel required
c) the utilisation and maintenance of equipment
d) the budget allocated by the government.

/I CAMBODIA

I CAMBODIA

1. Administrative organisation

Cambodia intends to set up a Hydro-meteorologic Bureau under the Ministry of Public Works, with the following terms of references:

- to provide assistance for aerial and maritime navigation,
- to ensure distribution of meteorological bulletins relating to general weather prediction, to predictions concerning maritime fishery and agriculture, typhoon or storm predictions, predictions of other dangerous climatic phenomena, and
- to publish reports on climatic, aerial, hydrological and geophysical data collected.

The Hydrometeorological Bureau would include several sections, namely:

1) Climate surveys and geophysics
2) Hydrology and agricultural meteorology
3) Predictions
4) Instruments
5) Technical operation

This last section would be in charge of operation of all stations, namely:

a) meteorological stations, both surface and altitude,
b) rainfall stations,
c) hydrological stations,
d) agro-meteorological stations.

For the operation of the hydrological system, Cambodia has 3 teams available, namely:

- The Stung Treng team, which covers all stations upstream the Kompong Cham
- The Great Lake team
- The Phnom Penh team

(Mekong main stem from Kompong Cham downstream, including the Tonle Sap and the Bassac)

/2. Personnel

2. Personnel

All personnel currently employed by Harza is being paid by Cambodia from its local contribution under the U.S. aid programme. The technicians are government officials, whose salary is paid on the national budget.

General service staff (mechanics, pilots, operators, boatmen etc.) will be employed by the government insofar as administrative regulations allow (like any other private corporation, Harza is paying to their staff a salary which is higher than the administration tariffs)

Office space

Mr. Khiou Bonthonn is taking the necessary measures for the construction of adequate.office premises for the contemplated Bureau of Hydrology and Meteorology.

3, Equipment

The various instruments, boats, jeeps etc. will be transferred to the Hydrometeorology Bureau.

Furniture loaned by USOM will also be transferred; we understand that an agreement has already been concluded with USOM in this respect.

Maintenance of the equipment shall be the responsibility either of the PWD (PWD workshop or river fleet workshop), or of private workshops.

4. Budget

The annual budget shall be considered by the Public Work Department (Hydrometeorology Bureau), and that portion corresponding to continuation of operation of the network installed by Harza shall include the following:

1) Meteorology	- Allocations for observers:			
	30 Riels per month			
	approximately R 10.000 x 12 =		R 120.000	
	- Maintenance		R 120.000	R 240.000
2) Hydrology	- Government officials	R 44.000		
	Daily personnel	R 41.000		
	85.000 x 12 =		R 1.020.000	
	per diem 10%=		R 73.000	R1.093.000

/3. Equipment

3) Equipment

- operation of 5 vessels
  fuel 3.000 litres per month x 12 = 36.000 litres
  cost 36.000 x 6 R = R 216.000
- maintenance 50.000 x 5 = 250.000 — R 466.000
- operation of 3 jeeps
  gasoline (20,000 km/year @ litres 18 per 100 km)
  = litres 3600 x 6 = R 21.600
  maintenance 10.000
  R 31.600
  for 3 jeeps 31.600 x 3 — R 94.800

4) Office furniture — R 106.200

Total = R 2.000.000

Conclusion

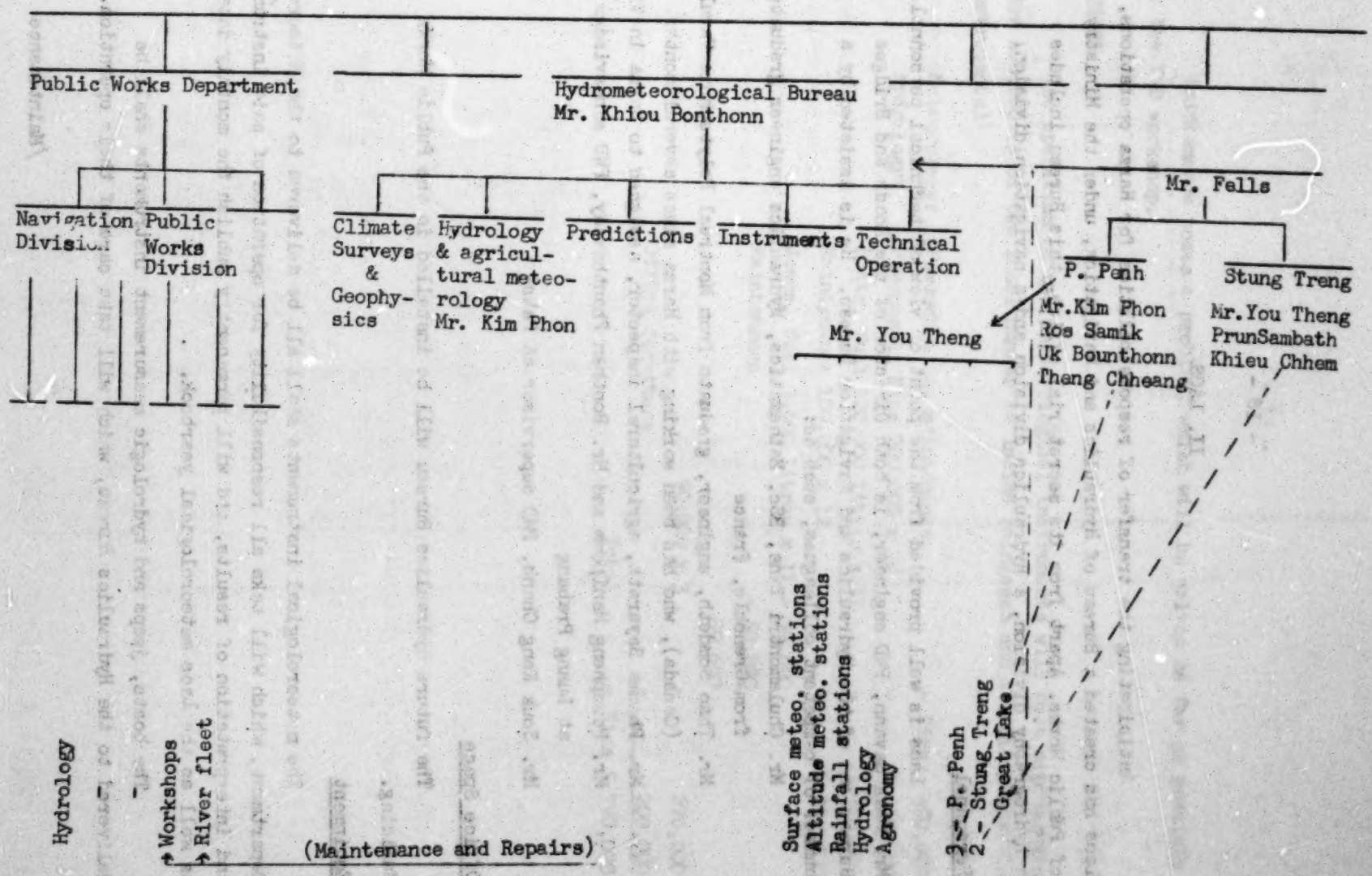
Cambodia has not sent any trainees to Bangkok. At the present time, apart from Mr. Fells, only Mr. Kim Phon and Mr. You Theng are capable of operating the bubble gages; they also have to deal with computations. But an engineer is required to study and interpret results.

Furthermore, other investigations will be undertaken in Cambodia in the near future (Tonle Sap, Prek Thnot, etc.) In consequence, it would be advisable to appoint several hydrology and meteorology technicians to assist the Director of the Hydrometeorology Bureau.

/CAMBODIA

CAMBODIA

Ministry of Public Works



II. LAOS

Anticipating the transfer of responsibilities for Harza operations, Laos has created a Bureau of Hydraulics and Navigation, under the Ministry of Public Works. Apart from its secretarial office, this Bureau includes a hydrography division, a hydraulics division and a navigation division.

Personnel

Laos is well provided from the point of view of technical personnel. Mr. Phak Savann, PWD engineer, is both Director of the Roads and Bridges Bureau and of the Hydraulics and Navigation Bureau. He is assisted by a number of competent colleagues, such as:

Mr. Chulamontri Tane, BSc. Mathematics, hydraulics engineer graduated from Grenoble, France

Mr. Thao Somdeth, engineer, graduate from Montreal Polytechnic Faculty (Canada), who has been working with Harza since several months.

Mr. Phomma Sayarath, agricultural inspector, assigned to Harza in Vientiane

Mr. Poumpheng Manipoum and Mr. Bontham Phanthavady, PWD supervisors at Luang Prabang

Mr. Souk Kong Chanh, PWD supervisor at Paksé

Office Space

The future hydraulics Bureau will be installed in the Public Works Building.

Equipment

The meteorological instruments shall all be delivered to the Meteorology Department, which will take all responsibility for operation of said instruments and interpretation of results, and will permanently publish the monthly data, as well as the Laos meteorological yearbook.

The boats, jeeps and hydrologic measurement instruments shall be delivered to the Hydraulics Bureau, which will take care of their operation.

/Maintenance

Maintenance poses a problem, which will be solved as far as possible by the PWD workshop.

Budget

The operation of the meteorological instruments will cost approximately Kips 400,000 (½ of the total number of Indian raingages and all other installed instruments)

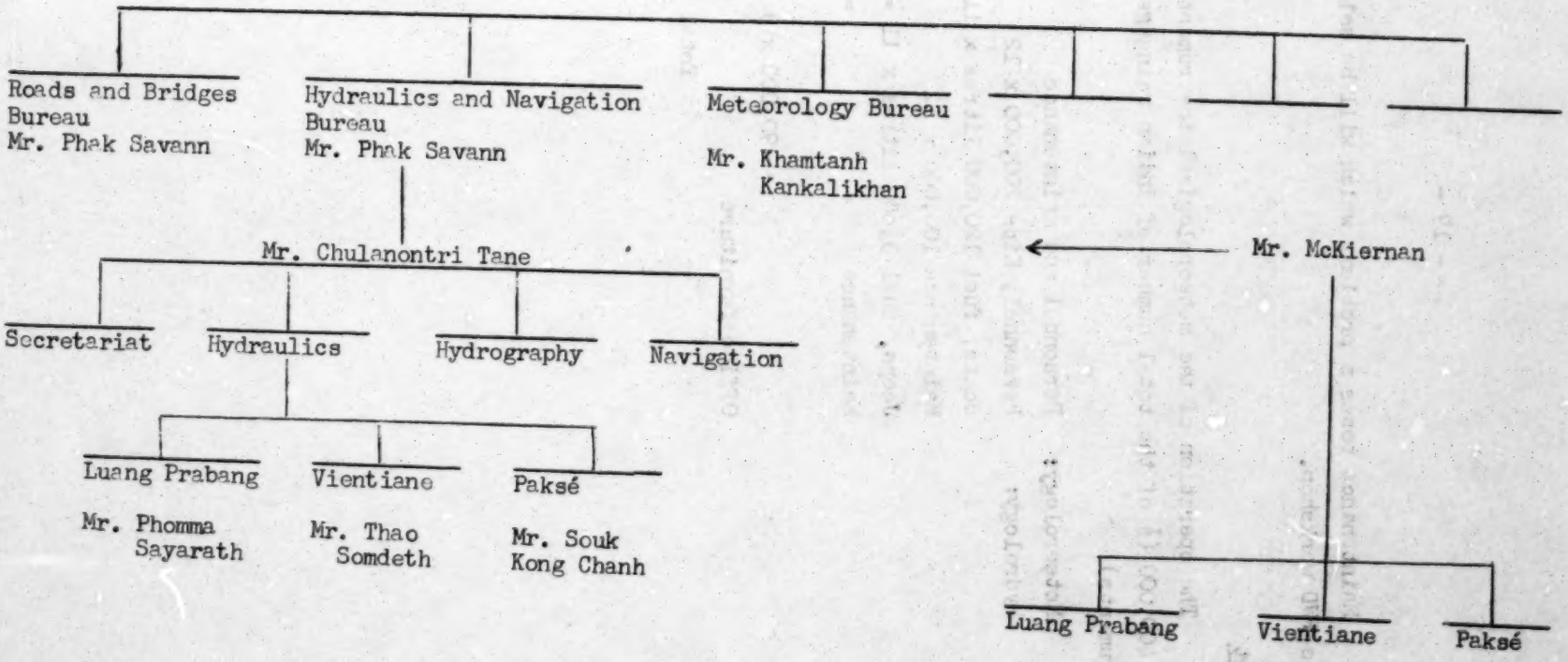
Meteorology:	Personnel and maintenance		= Kips	400,000
Hydrology:	Personnel, Kips 200,000 x 12		=	2,400,000
	Boats, fuel 120,000 litres x 11		=	1,320,000
	Maintenance 100,000 x 12		=	1,200,000
	Jeeps, fuel 3,600 litres x 11	= 39,600		
	Maintenance	= 50,000		
		89,600		
	90,000 x 3		=	270,000
	Office furniture		=	200,000
	Total		= Kips	5,790,000

MINISTRY OF PUBLIC WORKS

MINISTER

Secretary of State

Director General



III. THAILAND

The work to be carried on by the Government of Thailand after the termination of Harza Contract consists of three main programmes:

1) Meteorological Programme
2) Hydrological Programme
3) Hydrographical Programme

1) Meteorological Programme

The installation of the meteorological equipment which consists of raingages, evaporation equipment and additional meteorological equipment has been performed by Harza with the cooperation of the Meteorological Department of Royal Thai Navy and National Energy Authority. Most of the installations have been provided at the provincial meteorological stations. The Meteorological Department will be responsible for all equipment installed including collection of data, mainteneance and employment of personnel, but the payment of the personnel or observer will be derived from two sources, the local contribution of Mekong Project and the Meteorological Department.

2. Hydrological Programme

This is supposed to be the most important part of the project. It consists principally of stream gaging, collection of data, analysis of collected data and finally, the publication. This programme of work will be carried on by National Energy Authority. The operation will involve three problems as follows:

(1) Administrative organization
(2) Personnel
(3) Equipment and maintenance.

(1) Administrative Organization

The attached sheet of organization chart gives the general layout of the Mekong Project under the Office of the Prime Minister.

/(2) Personnel

(2) Personnel

The Mekong Project will be under the supervision of the Hydrological section. Chief of this section is Mr. Thaipuck Thammongkol, who received the M.S. degree in Civil Engineering from M.I.T. with four-month training at the U.S.B.R. and has been working for the Mekong Project from the beginning. Mr. Vibul Taweesup, Mr. Suvat Saquanwongse and Mr. Snun Ruanglek, who were graduated from Chulalongkorn University with the B.S. degree in Civil Engineering, are the qualified engineering assigned to Harza at Mukdahan and Chiang Saen as on-the-job training of local personnel. Other seven engineers and technicians are Mr. Siva Charoenpongse, Mr. Suthichai Kraikunasai, Mr. Roengyuth Bhumiratana, Mr. Prasiddhiphorn Chayangkanond, Mr. Kaiwan Pvaracharn, Mr. Singkorn Sagnasilpa and Mr. Kosil Ratanasiri. They have proved to be successful in both field work in stream gaging and office work in analysis of data.

Mr. Siri Chitchob, Mr. Chanchai and Mr. Thaworn, two others engineers and the lab technician respectively, have worked satisfactority for the Harza sedimentation lab for more than a year. They will collectively assume responsibility for the sediment laboratory work.

(3) Equipment and Maintenance

Equipment, maintenance including procurement will be under the direct responsibility of stores and procurement section. The repair of the equipment, boat motor, boat and jeep can be done either locally or in Bangkok as needed.

3) Hydrographical Programme

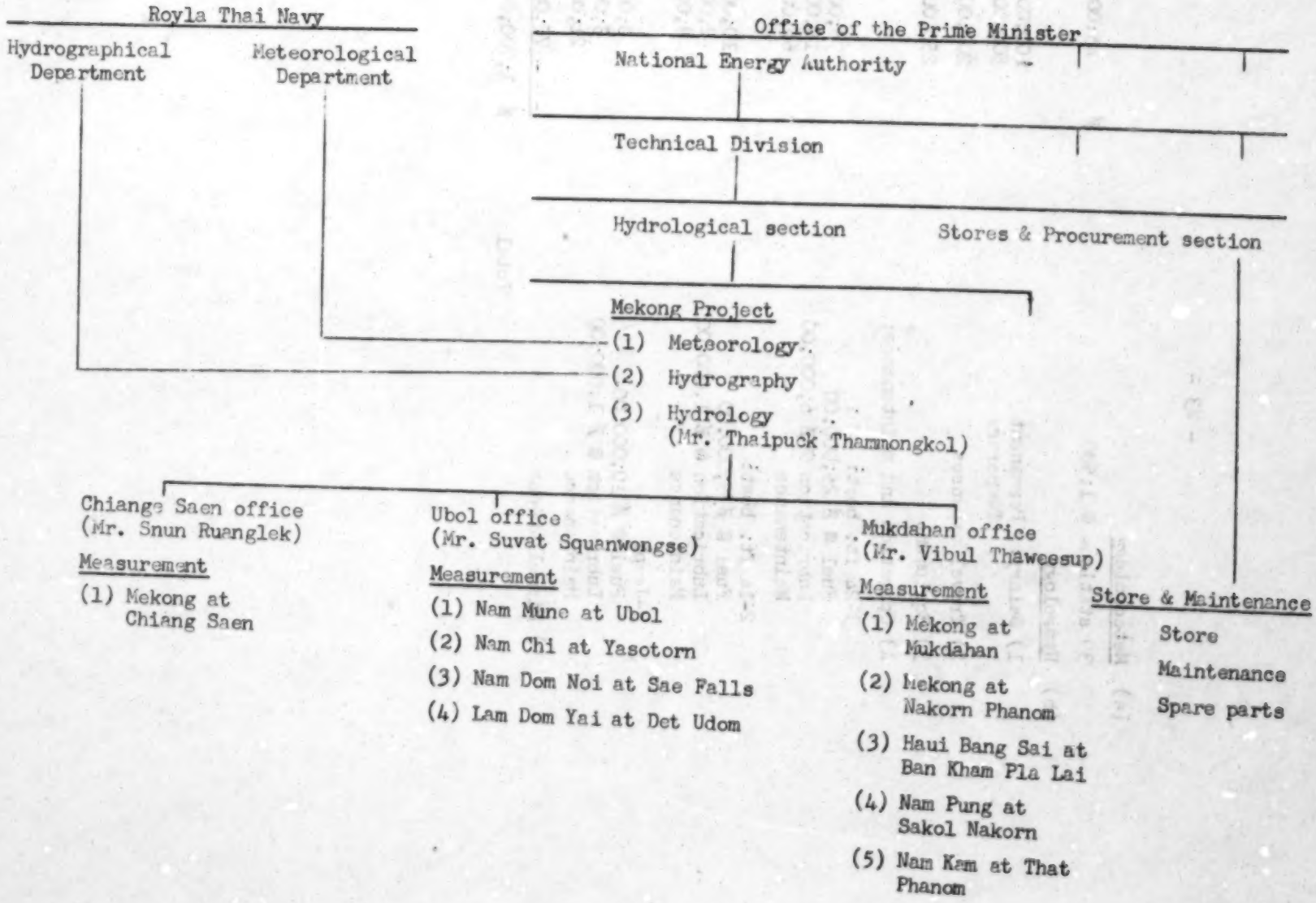
This programme will be under the direct responsiblity of the Hydrographical Department of the Royal Thai Navy.

Budget

The budget for continuation of Mekong River Investigation will be provided by the National Energy Authority:

/(a) Meteorology

(a) **Meteorology**		
30 stations @ 1,500		฿ 45,000.00
(b) **Hydrology**		
1) Salary: Permanent		400,000.00
Temporary		500,000.00
2) Travel expenses		200,000.00
3) Equipment		250,000.00
4) Operation and maintenance;		
3-24 ft. boat:		
Fuel @ ฿ 25,000.00		75,000.00
Lubrication @ ฿ 6,000.00		18,000.00
Maintenance		60,000.00
2-14 ft. boat:		
Fuel @ ฿ 5,000.00		10,000.00
Lubrication @ ฿ 1,000.00		2,000.00
Maintenance		8,000.00
3-Jeep:		
Fuel @ ฿ 10,000.00		30,000.00
Lubrication @ ฿ 1,000.00		3,000.00
Maintenance		21,000.00
5) Miscellaneous		78,000.00
Total		฿ 1,700,000.00


Royla Thai Navy
Hydrographical Department
Meteorological Department
Office of the Prime Minister
National Energy Authority
Technical Division
Hydrological section
Stores & Procurement section
Mekong Project
(1) Meteorology
(2) Hydrography
(3) Hydrology
(Mr. Thaipuck Thammongkol)
Chiange Saen office
(Mr. Snun Ruanglek)
Measurement
(1) Mekong at Chiang Saen
Ubol office
(Mr. Suvat Squanwongse)
Measurement
(1) Nam Mune at Ubol
(2) Nam Chi at Yasotorn
(3) Nam Dom Noi at Sae Falls
(4) Lam Dom Yai at Det Udom
Mukdahan office
(Mr. Vibul Thaweesup)
Measurement
(1) Mekong at Mukdahan
(2) Mekong at Nakorn Phanom
(3) Haui Bang Sai at Ban Kham Pla Lai
(4) Nam Pung at Sakol Nakorn
(5) Nam Kam at That Phanom
Store & Maintenance
Store
Maintenance
Spare parts

IV. VIET-NAM

Continuation of the work organised by Harza Corporation includes three items; namely:

I. Meteorology
II. Hydrology
III. Hydrography

I. Meteorology

Harza has provided from united States and United Kingdom donations the measurement instruments and has installed or paid for the installation of such instruments, which are currently being operated by the Viet-Nam Meteorology Bureau, but the salaries of personnel are being paid by the Mekong Office, from the local contribution under the United States assistance programme.

At the expiration of the Harza contract, the Meteorology Bureau will continue to operation the instruments, but will also assume responsibility for salaries, personnel and maintenance of instruments.

The technical services of the Meteorology Bureau will interpret the results of the measurements and will, as formerly, continue to publish such results in their yearbook.

II. Hydrology

1. Administrative organisation

The following organisation graph shows the role played by the Hydrology Department under the State Secretariat Public Works and Communications. The Navigation Division will be responsible for technical supervision, through its Hydrology Section.

2. Personnel

The Chief of the Hydrology Section is Mr. Le Phat Tan, an enginner who has attended the Harza training course in Bangkok, together with Mr. Tran Minh Ngoc, engineer, he will supervise the measurements to be taken. Five

/operators,

operators, Mr. Dang Huu Khanh, Mr. Truong Van Pung, Mr. Le Van Thuan, Mr. Ngo Dinh Vanh, Mr. Nguen Thai Binh, will constitute the shore parties at My Thuan, Chaudoc and Vam Cong. Mr. Vo Ngoc Diep, Technical Officer, former Harza trainee in Bangkok, shall be specially in charge of the sedimentation laboratory.

Harza's surplus personnel may be transferred to the Mekong administrative office.

3. Maintenance of equipment

Responsability for maintenance of the equipment shall rest with the Inland Waterways Navigation Section:

a) for the boats (hull and infrastructure): River fleet workshop

b) for the boat engines and other instruments: Phu An workshop.

III. Hydrography

This work shall be undertaken by the Hydrographic Service, headed by Mr. Chu Ba Tuong, engineer, who has attended a training course in Australia and is currently counterpart manager in Viet-Nam of the Navigation Survey Project financed by the Un Special Fund. With the help of equipment provided under US bilateral assistance, completed by equipment provided under the Navigation Project, the Hydrographic Section will be able to continue hydrographic survey operations in Viet-Nam.

Budget

The annual budget to be provided for the continuation of the work will be included in the budget of the Public Works and Communication Department.

/Meteorology and ..

Meteorology and Navigation Divisions

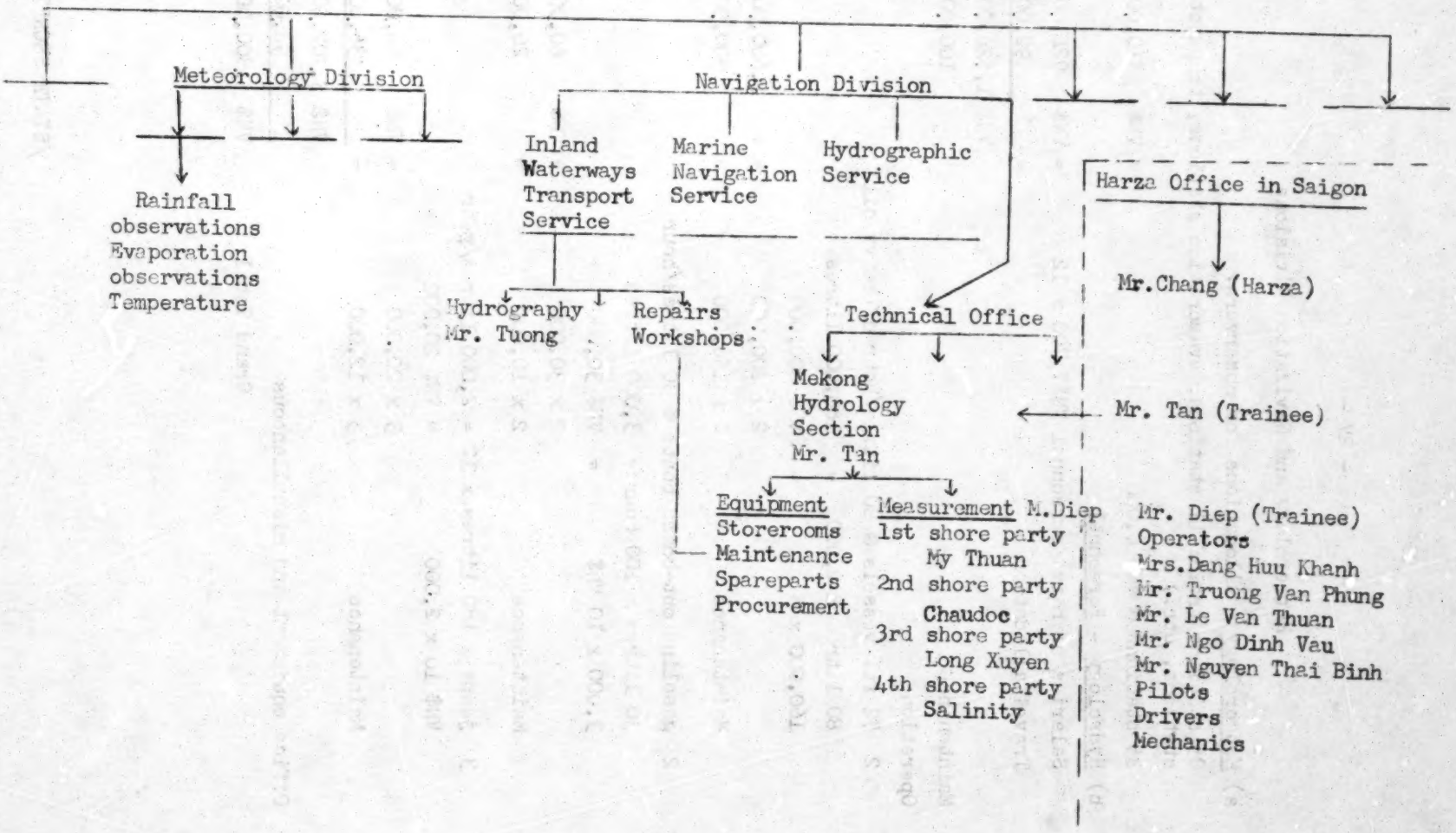
a) Metecrology - Allocations for observers:

85 stations (rainfall stations, evaporation stations, temperature stations, etc.)

85 stations @ VN$ 6,000	= VN$	510,000
b) Hydrology - Personnel		
Salaries of Harza personnel VN$7,700 x 12	= VN$	924,000
Travel allocation	=	92,000
	VN$	1,526,000
Maintenance		100,000
Operation:		
2 52 ft. vessels @ 80 litres/hour of heavy oil		
80 litres x 2,000 = 160,000 litres		
160,000 x 5 = VN$ 800,000		
2 x 800,000	= VN$	1,600,000
Maintenance 2 x 150,000	=	300,000
2 gasoline out-board boats @ 30 litres/hour		
30 litres x 100 hour = 3,000 litres		
3,000 x 10 VN$ = VN$ 30,000		
2 x 30,000	= VN$	60,000
Maintenance 2 x 10,000	=	20,000
3 jeeps @ 180 litres x 12 = 2,000 litres/year		
VN$ 10 x 2,000 = VN$ 20,000		
3 x 20,000	= VN$	60,000
Maintenance 3 x 12,000	=	36,000
	VN$	3,702,000
Office equipment and miscellaneous		98,000
Grand Total:	VN$	3,800,000

/STATE SECRETARIAT ...

STATE SECRETARIAT FOR PUBLIC WORKS AND COMMUNICATIONS



Section 3

RECOMMENDATIONS

It is recommended to:

(1) Obtain the services of two associate hydraulics engineers speaking both English and French, who would work under the supervision of the WMO expert assigned to the Office of the Executive Agent. Those engineers would make frequent visits to the hydrologic and meteorologic stations in the riparian countries and inspect measurement operations. They shall demonstrate adjustments and repairs, as the need may arise, and advise on the standard method used throughout the Mekong Basin. Considering that said engineers will have to make frequent field trips, one of them might be based in Phnom-Penh, and the other in Vientiane. Two jeeps, currently used by the Harza Office in Bangkok, will be made available to them. Their assistance would be necessary from 1 April 1962 through 31 December 1964.

(2) Obtain the services of a general service agent to centralize results of measurement operations in the Office of the Executive Agent in Bangkok, to organize the presentation of such results and publish the Mekong hydrological year-book.

As concerns the riparian countries, it is recommended:

(3) that they respectively elicit a government decision (except in Laos), e.g. in the form of a decree or administrative instructions, organizing the hydrologic and meteorologic service after the departure of Harza.

(4) that they obtain approval of the respective above-mentioned budgets, including items for personnel and maintenance. Part of the maintenance funds should be provided in foreign currency for the procurement of spare parts. Harza's estimates envisage US$200,000 for all four riparian countries for a period of five years. In consequence, each riparian country should allocate about US$10,000 per year.